

We claim:

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1. An isolated nucleic acid molecule encoding a PNHX transporter polypeptide, or a fragment of a polypeptide having Na^+/H^+ transporter activity and capable of increasing salt tolerance in a cell.
2. An isolated nucleic acid molecule encoding a THX transporter polypeptide, PNHX transporter polypeptide, or a fragment of a polypeptide having Na^+/H^+ transporter activity and capable of increasing salt tolerance in a cell, comprising a nucleic acid molecule selected from the group consisting of:
 - (c) a nucleic acid molecule that hybridizes to all or part of a nucleic acid molecule shown in [SEQ ID NO:1], [SEQ ID NO:3], [SEQ ID NO:17], [SEQ ID NO:19], or a complement thereof under moderate or high stringency hybridization conditions, wherein the nucleic acid molecule encodes a TNH~~X~~ transporter polypeptide, a PNHX transporter polypeptide or a polypeptide having Na^+/H^+ transporter activity and capable of increasing salt tolerance in a cell;
 - (d) a nucleic acid molecule degenerate with respect to (a), wherein the nucleic molecule encodes a TNH~~X~~ transporter polypeptide, a PNHX transporter polypeptide or a polypeptide having Na^+/H^+ transporter activity and capable of increasing salt tolerance in a cell.
3. The nucleic acid molecule of claim 2, wherein the hybridization conditions comprise moderate or high stringency conditions selected from conditions about those in Table 4.
4. An isolated nucleic acid molecule encoding a THX transporter polypeptide or a PNHX transporter polypeptide, or a fragment of a polypeptide having Na^+/H^+ transporter activity and capable of increasing salt tolerances in a cell, comprising a nucleic acid molecule selected from the group consisting of:
 - (f) the nucleic acid molecule of the coding strand shown in [SEQ ID NO:1], [SEQ ID NO:3], [SEQ ID NO:17], [SEQ ID NO:19] or a complement thereof;
 - (g) a nucleic acid molecule encoding the same amino acid sequence as a nucleotide sequence of (a); and

- (h) a nucleic acid molecule having at least 17% identity with the nucleotide sequence of (a) and which encodes a THX transporter polypeptide or the PNHX transporter polypeptide or a polypeptide having Na⁺/H⁺ transporter activity.

5. The nucleic acid molecule of any of claims 1 to 4, wherein the THX transporter polypeptide or the PNHX transporter polypeptide comprises an AtNHX transporter polypeptide having Na⁺/H⁺ transporter activity and capable of increasing salt tolerance in a cell.
6. The nucleic acid molecule of claim 1, comprising all or part of a nucleotide sequence shown in [SEQ ID NO:1], [SEQ ID NO:3], [SEQ ID NO:17], [SEQ ID NO:19], or a complement thereof.
7. An AtNHX nucleic acid molecule isolated from *Arabidopsis thaliana*, or a fragment thereof encoding a transporter polypeptide having Na⁺/H⁺ transporter activity and capable of increasing salt tolerance in a cell.
8. A recombinant nucleic acid molecule comprising a nucleic acid molecule of any of claims 1 to 4 and a constitutive promoter sequence or an inducible promoter sequence, operatively linked so that the promoter enhances transcription of the nucleic acid molecule in a host cell.
9. The nucleic acid molecule of claim 6, wherein the molecule comprises genomic DNA, cDNA or RNA.
10. The nucleic acid molecule of claim 6, wherein the nucleic acid molecule is chemically synthesized.
11. The nucleic acid molecule of claim 6, wherein the nucleic acid molecule is isolated from *Arabidopsis thaliana*.
12. The nucleic acid molecule of any of claims 1 to 4, wherein the TNHX transporter polypeptide or the PNHX transporter polypeptide is capable of extruding monovalent cations out of the cytosol of a cell to provide the cell with increased salt tolerance, wherein the monovalent cations are selected from at least one of the group consisting of sodium, lithium and potassium.
13. The nucleic acid molecule of claim 12, wherein the cell comprises a plant cell.

57 14. The nucleic acid molecule of claim 13, wherein the monovalent cations are extruded into a vacuole or into the extracellular space.

15. An isolated nucleic acid molecule comprising a nucleic acid molecule selected from the group consisting of 8 to 10 nucleotides of the nucleic acid molecule of claim 6, 11 to 25 nucleotides of the nucleic acid molecule of claim 6 and 26 to 50 nucleotides of the nucleic acid molecule of claim 6.

16. An isolated oligonucleotide comprising at least about 10 nucleotides from a sequence selected from the group consisting of 5'-GCCATGTTGGATTCTCTAGTGTCTG-3' [SEQ ID NO:11], 5'-CCGAATTCTCAAAGCTTTTCTTCCACG-3' [SEQ ID NO:12], 5'-CGGAATTCACAGAAAAACACAGTGAGGAT-3' [SEQ ID NO:13], 5'-GCCATGTTGGATTCTCTAGTGTCTG-3' [SEQ ID NO:14], 5'-CCGAATTCTCAAAGCTTTTCTTCCACG-3' [SEQ ID NO:15] and 5'-CGGAATTCACAGAAAAACACAGTGAGGAT-3' [SEQ ID NO:16].

17. A vector comprising the nucleic acid molecule of any of claims 1 to 4.

58 18. The vector of claim 17, comprising a promoter selected from the group consisting of a super promoter, a 35S promoter of cauliflower mosaic virus, a drought-inducible promoter, an ABA-inducible promoter, a heat shock-inducible promoter, a salt-inducible promoter, a copper-inducible promoter, a steroid-inducible promoter and a tissue-specific promoter.

59 sub B4 19. A host cell comprising the recombinant nucleic acid molecule of claim 8 or the vector of claim 17, or progeny of the host cell.

20. The host cell of claim 19, selected from the group consisting of a fungal cell, a yeast cell, a bacterial cell, a microorganism cell and a plant cell.

sub B5 21. A plant, a plant part, a seed, a plant cell or progeny thereof comprising the recombinant nucleic acid molecule of claim 8 or the vector of claim 17.

22. The plant part of claim 21, comprising all or part of a leaf, a flower, a stem, a root or a tuber.

sub B6 23. The plant, plant part, seed or plant cell of claim 21, wherein the plant, plant part, seed or plant cell is of a species selected from the group consisting of potato, tomato, brassica, cotton, sunflower, strawberries, spinach, lettuce, rice, soybean, corn, wheat, rye, barley,

~~atriplex, sorghum, alfalfa, salicornia and the plants in Table 5.~~

24. The plant, plant part, seed or plant cell of claim 21, wherein the plant comprises a dicot plant.

25. The plant, plant part, seed or plant cell of claim 21, wherein the plant comprises a monocot plant.

sub 07 → 26. A method for producing a recombinant host cell capable of expressing the nucleic acid molecule of any of claims 1 to 4, ~~the method comprising introducing into the host cell a vector of claim 17.~~

27. A method of producing a genetically transformed plant which expresses TNHx or PNHX transporter polypeptide, comprising regenerating a genetically transformed plant from the plant cell, ~~seed or plant part of claim 21.~~

sub 08 → 28. The method of claim 27, wherein the genome of the host cell also includes a functional TNHx or PNHX gene.

29. The method of claim 27, wherein the genome of the host cell does not include a functional TNHx or PNHX gene.

30. A transgenic plant produced according to the method of claim 27.

sub 09 → 31. A method for expressing a TNHx or PNHX transporter polypeptide in the host cell of claim 19, or the plant, plant part, seed or plant cell of claim 21, the method comprising culturing the host cell under conditions suitable for gene expression.

sub 10 → 32. A method for producing a transgenic plant that expresses elevated levels of PNHX transporter polypeptide relative to a non-transgenic plant, comprising transforming a plant with the vector of claim 17.

33. An isolated polypeptide encoded by and/or produced from the nucleic acid molecule of any of claims 1 to 4, or the vector of claim 17.

34. An isolated PNHX transporter polypeptide or a fragment thereof having Na⁺/H⁺ transporter activity and capable of increasing salt tolerance in a cell.

35. The polypeptide of claim 34 comprising an AtNHX transporter polypeptide.

36. The polypeptide of claim 35 comprising all or part of an amino acid sequence in [SEQ

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ID NO:2], [SEQ ID NO:4], [SEQ ID NO:18] or [SEQ ID NO:20].

37. A polypeptide fragment of the AtNHX transporter polypeptide of claim 35, or a peptide mimetic of the AtNHX transporter polypeptide, having Na^+/H^+ transporter activity and capable of increasing salt tolerance in a cell.
38. The polypeptide fragment of claim 37, consisting of at least 20 amino acids, which fragment has Na^+/H^+ transporter activity and is capable of increasing salt tolerance in a cell.
39. The fragment or peptide mimetic of claim 36, which is capable of being bound by an antibody to the polypeptide of claim 6.
40. The polypeptide of claim 34 which is recombinantly produced.
41. An isolated and purified transporter polypeptide comprising the amino acid sequence of a TNHx transporter polypeptide or a PNHX transporter polypeptide, wherein the transporter polypeptide is encoded by a nucleic acid molecule that hybridizes under moderate or stringent conditions to a nucleic acid molecule in [SEQ ID NO:1], [SEQ ID NO:3], [SEQ ID NO:17], [SEQ ID NO:19], a degenerate form thereof or a complement.
42. A polypeptide comprising a sequence having greater than 28% sequence identity to the polypeptide of claim 36.
43. The polypeptide of claim 35, wherein the polypeptide comprises a Na^+/H^+ transporter polypeptide.
44. The polypeptide of claim 43, isolated from *Arabidopsis thaliana*.
45. An isolated nucleic acid molecule encoding the polypeptide of claims 34, 35 or 37.
46. An antibody directed against the polypeptide of claim 36.
47. The antibody of claim 46, comprising a monoclonal antibody or a polyclonal antibody.
48. An isolated nucleic acid molecule encoding a TNHx transporter polypeptide or a PNHX transporter polypeptide, or a fragment of a polypeptide having Na^+/H^+ transporter activity and capable of increasing salt tolerance in a cell, comprising a nucleic acid molecule selected from the group consisting of:

- (a) a nucleic acid molecule that hybridizes to all or part of a nucleic molecule in

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overexpresses a TNH_X transporter polypeptide, a PNH_X transporter polypeptide or a polypeptide having Na⁺/H⁺ transporter activity and capable of increasing salt tolerance in a cell and wherein the plant has increased salt tolerance, comprising:

- e) cloning or synthesizing a TNH_X nucleic acid molecule, a PNH_X nucleic acid molecule or a nucleic acid molecule which codes for a Na⁺/H⁺ transporter polypeptide, wherein the polypeptide is capable of providing salt tolerance to a plant;
- f) inserting the nucleic acid molecule in a vector so that the nucleic acid molecule is operably linked to a promoter;
- g) inserting the vector into a plant cell or plant seed;
- h) regenerating the plant from the plant cell or plant seed, wherein salt tolerance in the plant is increased compared to a wild type plant.

54. A transgenic plant produced according to the method of claim 53.

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